

CLAIMS

1. A method of preparing a substantially environmentally benign deicing composition, said method comprising:

(a) recovering an industrial waste stream comprising a hydroxycarboxylic acid; and

(b) alcoholizing at least a portion of hydroxycarboxylic acids in said recovered waste stream with an alkyl alcohol to convert said portion of hydroxycarboxylic acids to water soluble hydroxycarboxylic acid esters.

2. A deicing composition comprising a water soluble hydroxycarboxylic acid ester.

3. A deicing composition as defined in Claim 2 wherein said hydroxycarboxylic acid ester is selected from the group consisting of hydroxyformate, hydroxyacetate, hydroxypropionate, hydroxybutyrate, hydroxylaurate, hydroxypalmitate, hydroxyoleate, hydroxybenzoate, and mixtures thereof.

4. A deicing composition as defined in Claim 3 wherein said hydroxycarboxylic acid ester comprises an alkyl lactate.

5. A deicing composition as defined in Claim 2 further comprising a low molecular weight glycosides.

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6. A deicing composition as defined in Claim 2 further comprising a lignin compound.

7. A deicing composition as defined in Claim 2 further comprising an anionic hydroxycarboxylic acid salts alone or with amino acids.

8. A deicing composition as defined in Claim 2 further comprising water soluble salts of dicarboxylic acids having at least three carbon atoms.

9. A deicing composition as defined in Claim 8 wherein said dicarboxylic acid is selected from the group consisting of adipic acid, succinic acid, glutaric acid, malonic acid and mixtures thereof.

10. A deicing composition as defined in Claim 2 wherein said hydroxycarboxylic acid ester is selected from the group consisting of ethyl lactate, glycol lactate, methyl lactate, ethyl glycinate, ethyl levulinate, ethylenecarbonate, glycerin carbonate, pipercolate, tetrahydrofurfuryl acetate, tetrahydrofurfuryl tetrahydrofuroate, glucose glutamate, and mixtures thereof.

11. A deicing composition as defined in Claim 2 further comprising a salt selected from the group consisting of sodium lactate, cesium acetate, sodium acetate, potassium acetate, sodium formate, sodium citrate, lysine glutamate, sodium glucoheptonate, sodium and potassium salts of adipic, glutaric, succinic and malonic acids, lignin sulfonate and mixtures thereof.

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12. A deicing composition as defined in Claim 2 wherein said hydroxycarboxylic acid ester is obtained by alcoholizing hydroxycarboxylic acids contained in industrial waste streams, said waste streams comprising distiller grain solubles, whey, pulp mill black liquor, furfuryl derivatives from oats or mixtures thereof, with an alkyl alcohol.

13. A deicing composition as defined in Claim 2 which is obtained by internal alcoholysis resulting from the acid treatment of pre-distilled wood, agricultural fermentation and/or milk fermentation.

14. A method as defined in Claim 1 wherein said waste stream further comprises sugars and said alcoholizing step further comprises converting at least a portion of said sugars to glycosides.

15. A method as defined in Claim 1 wherein said sugars are selected from the group consisting of sorbitols, maltoses, glucoses and mixtures thereof.

16. A method of preparing a substantially benign deicing composition, said method comprising:

(a) recovering an industrial waste stream comprising a water soluble hydroxycarboxylic acid; and

(b) adding an effective amount of a freezing point lowering compound to said industrial waste stream, said freezing point lowering compound selected from the group consisting of water soluble hydroxycarboxylic acid esters, glycosides and mixtures thereof.

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17. A method of preparing a substantially environmentally benign deicing composition, said method comprising:

(a) recovering an industrial waste stream comprising a sugar compound; and

(b) alcoholizing at least a portion of the sugar compound in said recovered waste stream with an alkyl alcohol to convert said portion of sugar compound to alkyl glucosides.

18. A method as defined in Claim 17 wherein said sugar comprises glucose, said alkyl alcohol comprises ethanol and said alkyl glucoside comprises ethyl glucoside.

19. A method of preparing a substantially environmentally benign deicing composition, said method comprising:

(a) recovering an industrial waste stream comprising a water soluble hydroxycarboxylic acid; and

(b) reacting at least a portion of said water soluble hydroxycarboxylic acid to form anionic hydroxycarboxylic acid salts.

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20. A method for deicing and/or anti-icing a surface, said method comprising:

applying to said surface a composition comprising:

(a) a deicing and/or anti-icing agent comprising at least about 15 weight percent of a hydrocarbyl aldose and

(b) water.

21. A method as defined in Claim 20 wherein said hydrocarbyl aldose comprises an alkyl aldose.

22. A method as defined in Claim 20 wherein said hydrocarbyl aldose is selected from the group consisting of glucosides, furanosides, maltosides, maltotriosides, glucopyranosides and mixtures of any of the foregoing.

23. A method as defined in Claim 21 wherein said alkyl aldose comprises alpha-methyl glucoside.

24. A method as defined in Claim 20 wherein said hydrocarbyl aldose comprises sorbitol.

25. A method as defined in Claim 20 wherein said deicing and/or anti-icing composition further comprises a freezing point lowering additive selected from the group consisting of hydroxycarboxylic acid salts, acetate salts, formate salts, citrate salts, amino acid and their salts, dicarboxylic acid salts, lignin components, boric acid at its salts and mixtures thereof.

26. A method as defined in Claim 24 wherein said freezing point lowering additive is selected from the group consisting of sodium lactate, cesium acetate, sodium acetate, potassium acetate, sodium formate, sodium citrate, lysine glutamate, sodium glucoheptonate, sodium and potassium salts of adipic, glutaric, succinic and malonic acids, boric acid, sodium borate, lignin sulfonate and mixtures thereof.

27. A de-icing and/or anti-icing agent composition comprising:

- (a) a hydroxycarboxylic acid salt,
- (b) a hydrocarbyl aldose and
- (c) water.

28. A composition as defined in Claim 27 wherein said hydroxycarboxylic acid salt comprises sodium lactate.

29. A composition as defined in Claim 27 wherein said hydrocarbyl aldose comprises an alkyl aldose.

30. A composition as defined in Claim 27 wherein said hydrocarbyl aldose is selected from the group consisting of glucosides, furanosides, maltosides, maltotriosides, glucopyranosides and mixtures of any of the foregoing.

31. A method as defined in Claim 29 wherein said alkyl aldose comprises alpha-methyl glucoside.

32. A method as defined in Claim 27 wherein said hydrocarbyl aldose comprises sorbitol.

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5 33. A composition as defined in Claim 27 further comprising a freezing point lowering additive selected from the group consisting of cesium acetate, sodium acetate, potassium acetate, sodium formate, sodium citrate, lysine glutamate, sodium glucoheptonate, sodium and potassium salts of adipic, glutaric, succinic and malonic acids, boric acid, sodium borate lignin sulfonate and mixtures thereof.

34. A de-icing and/or anti-icing agent composition comprising:

- (a) a hydrocarbyl aldohexose,
- (b) a hydroxycarboxylic acid ester, and
- (c) water.

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